

# NASA TECH BRIEF

## *Langley Research Center*



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### Vortex-Lattice FORTRAN Program For Estimating Subsonic Aerodynamic Characteristics of Complex Planforms

#### The problem:

In recent years, some aircraft wings have become very complex because of the varied speed regimes in which they are required to operate. Computing procedures for predicting the aerodynamic characteristics of these wings become very involved if an adequate representation of the planform is to be made.

#### The solution:

In order to solve the problem of preliminary designs or for parametric evaluations, a computer program was developed for estimating the subsonic aerodynamic characteristics of complex planforms.

#### How it's done:

The program represents the lifting planforms with a vortex-lattice. These complex planforms include wings with variable-sweep outer panels, wings with several changes in dihedral angle across the span, wings with twist and/or camber, and a wing in conjunction with either tail or a canard.

The aerodynamic characteristics of interest are lift and pitching moment for both the flat and/or twisted wing, drag-due-to-lift parameter, leading-edge thrust, leading-edge suction, distributions of leading-edge thrust and suction coefficients, distributions of several span loading coefficients, distribution of lifting pressure coefficient, damping-in-pitch parameter, damping-in-roll parameter, and lift coefficient due to pitch rate.

The program uses a minimum of input data to describe relatively complex planforms. These planforms may be described by up to 24-line segments on a semi-span. They may have an outboard variable-sweep panel or they may have several dihedral angles across the span. In addition, two planforms may be used together to represent a combination of wings and tails or wings, bodies, and tails. The analysis has been extended to handle planforms in a sidewash field.

The documentation provides examples and typical running times of various types of configurations which can be used. In addition, the results of parametric applications of the program are presented to provide guidance in specifying vortex-lattice arrangements which can be expected to give acceptable results.

#### Notes:

1. This program is written in FORTRAN IV to be used on the CDC-6000 Series computers with SCOPE 3.0 Base Operating System and Library Tape.
2. Inquiries concerning this program should be directed to:

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